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Feldman et al.

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(54) **METHOD AND SYSTEM OF IMPLEMENTING CORRECTIONS IN UNDERWATER IMAGES**

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This patent is subject to a terminal disclaimer.

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(52) **U.S. Cl.** **101/171**; 400/76; 400/70; 400/61

(58) **Field of Search** 101/171; 400/76, 400/70, 61

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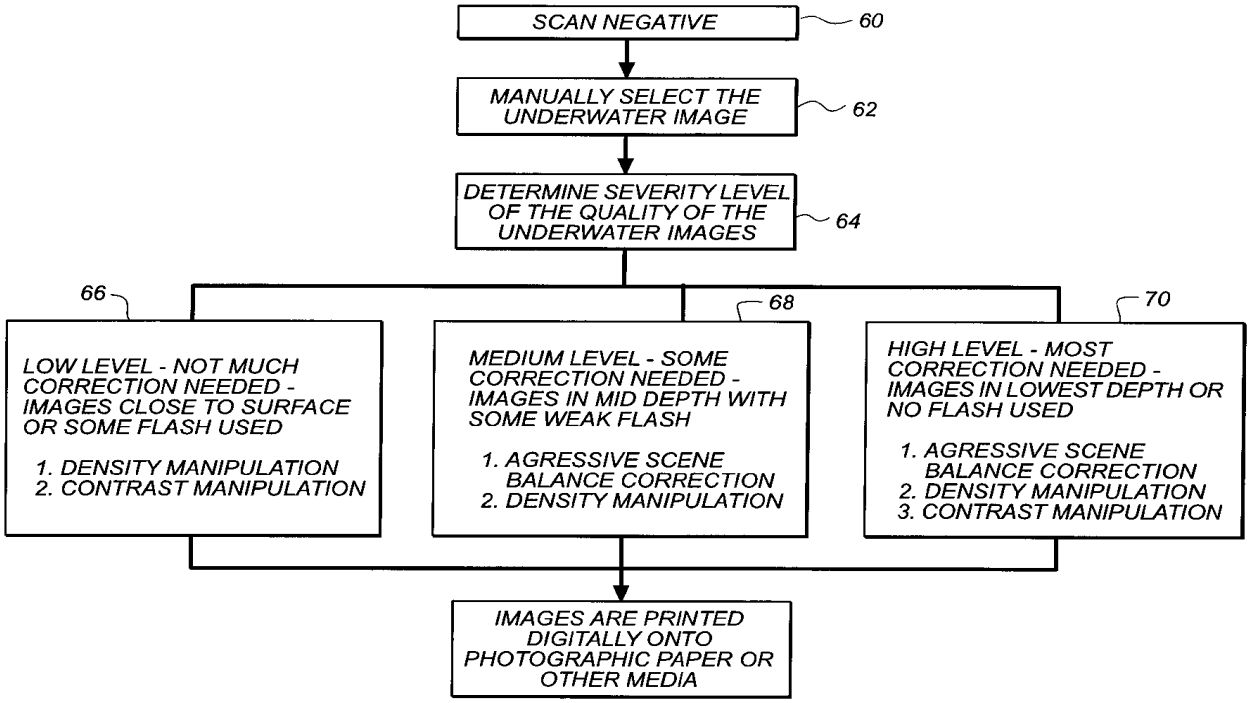
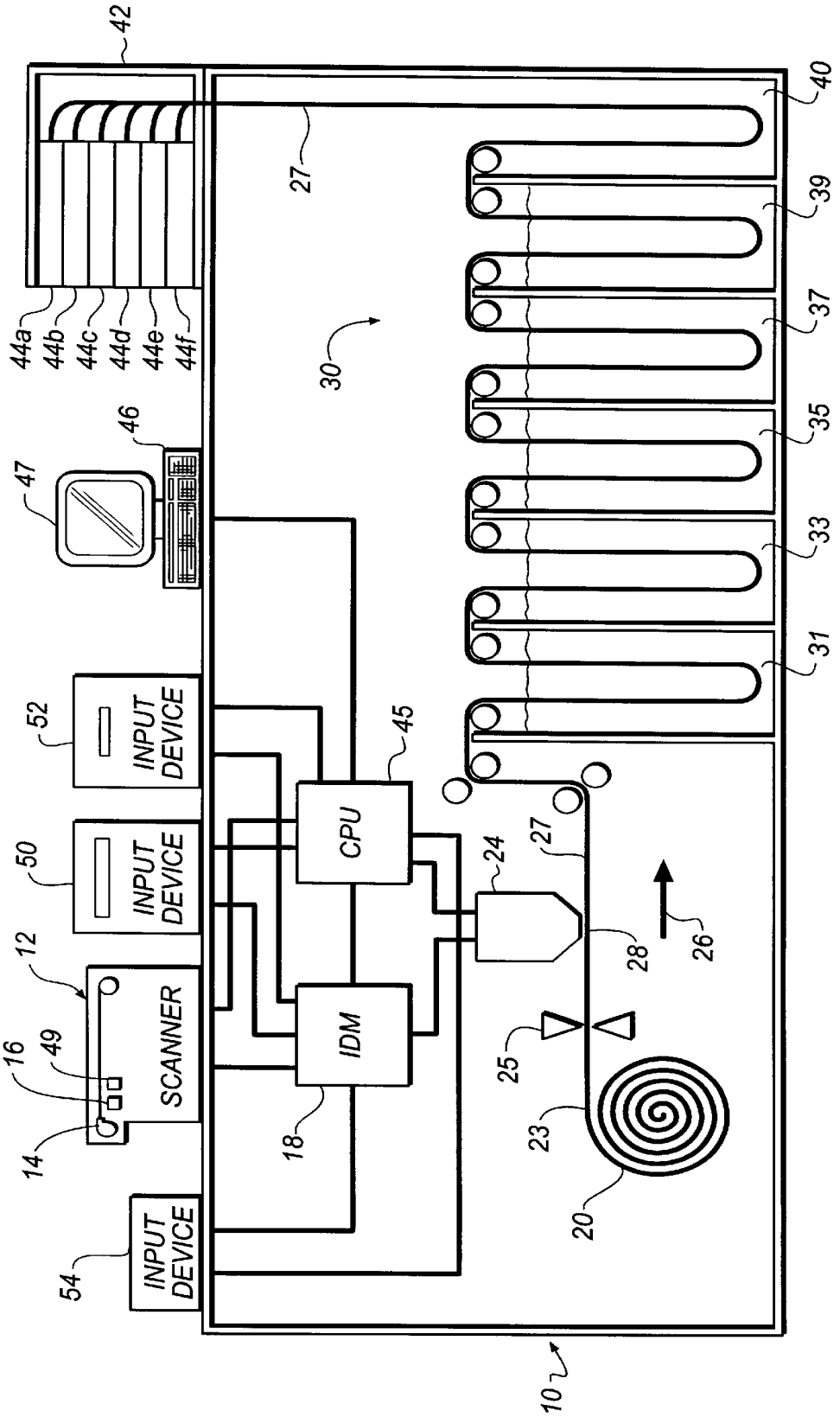
(57) **ABSTRACT**

A method and system for printing a customer image order containing at least one image captured underwater. A digital record of a customer image order containing at least one image captured underwater is obtained. The image captured underwater is determined and a level of correction is also determined. The digital record of the underwater captured image is modified in the determined manner. The determination of the existence of an image captured underwater may be provided by analyzing the image record or obtained by reading information received from the customer image order. Thereafter modified image may be printed and/or displayed.

26 Claims, 6 Drawing Sheets

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44d
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44f
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INPUT DEVICE
45
CPU
50
INPUT DEVICE
24
27
12
SCANNER
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26
16
49
IDM
25
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18
23
20
54
INPUT DEVICE
10

FIG. 1

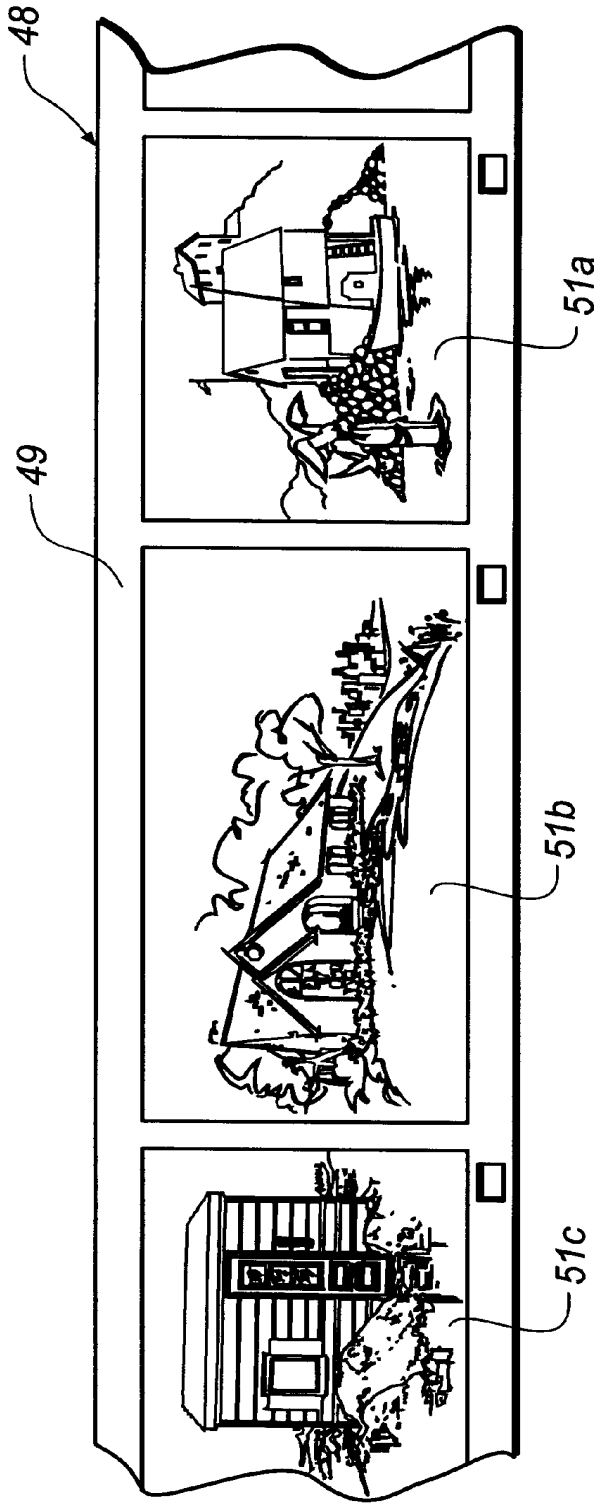


FIG. 2

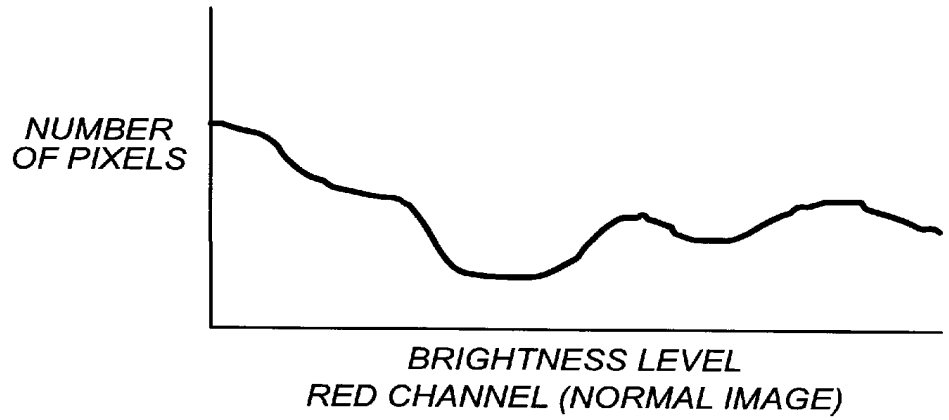


FIG. 3a

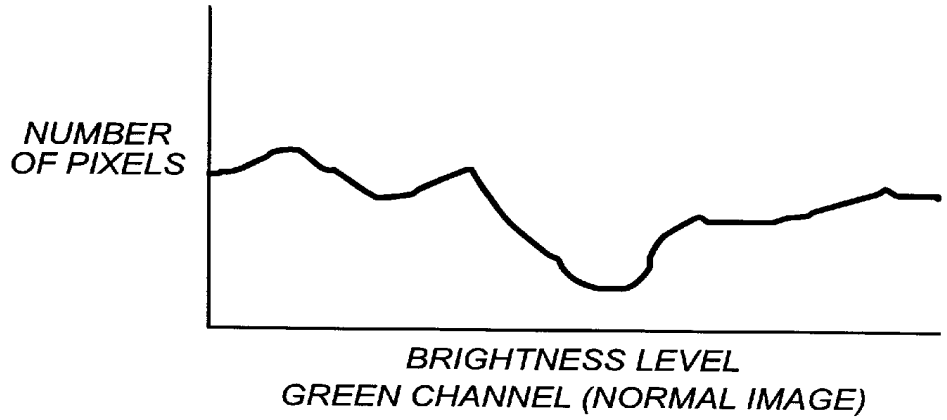


FIG. 3b

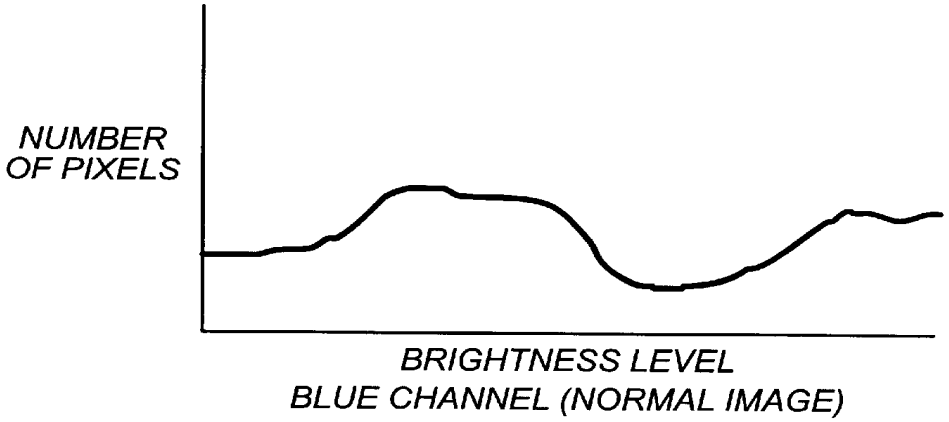


FIG. 3c

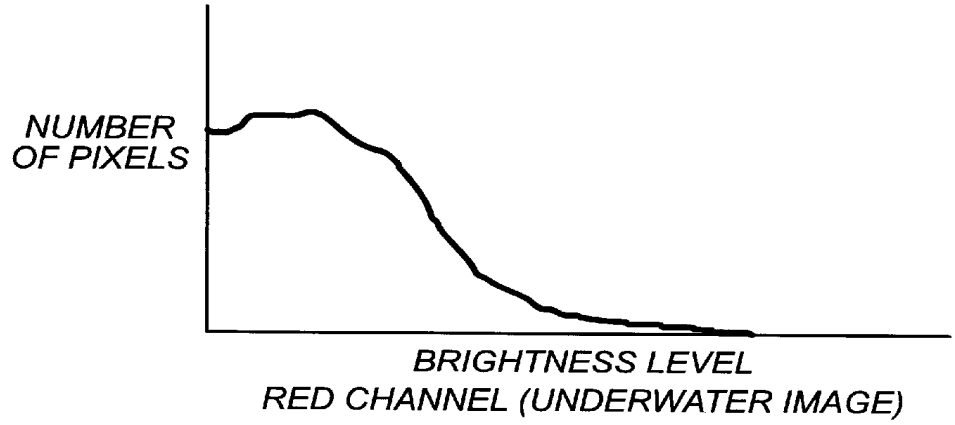


FIG. 4a

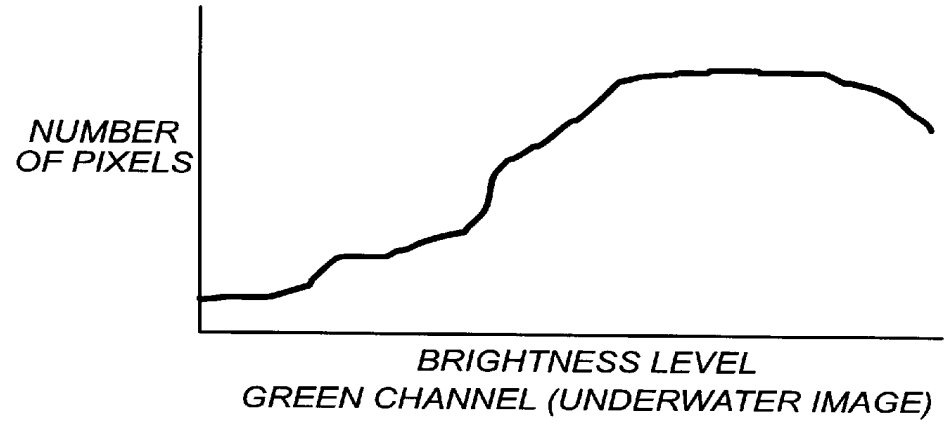


FIG. 4b

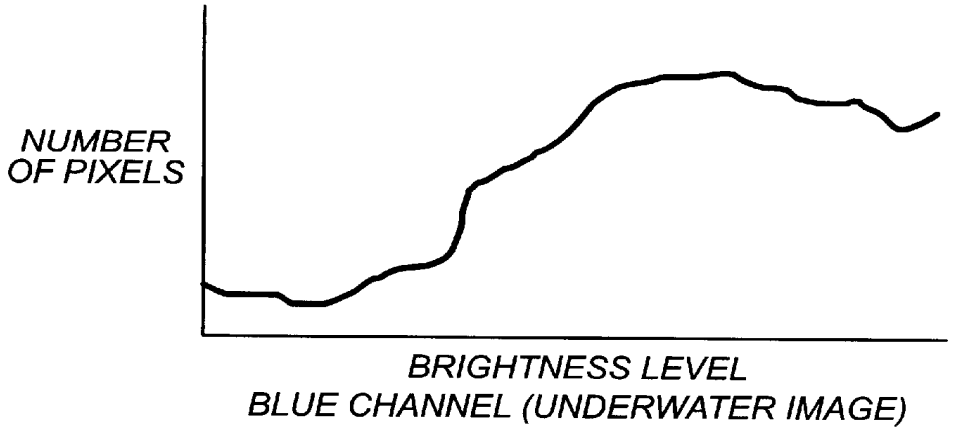
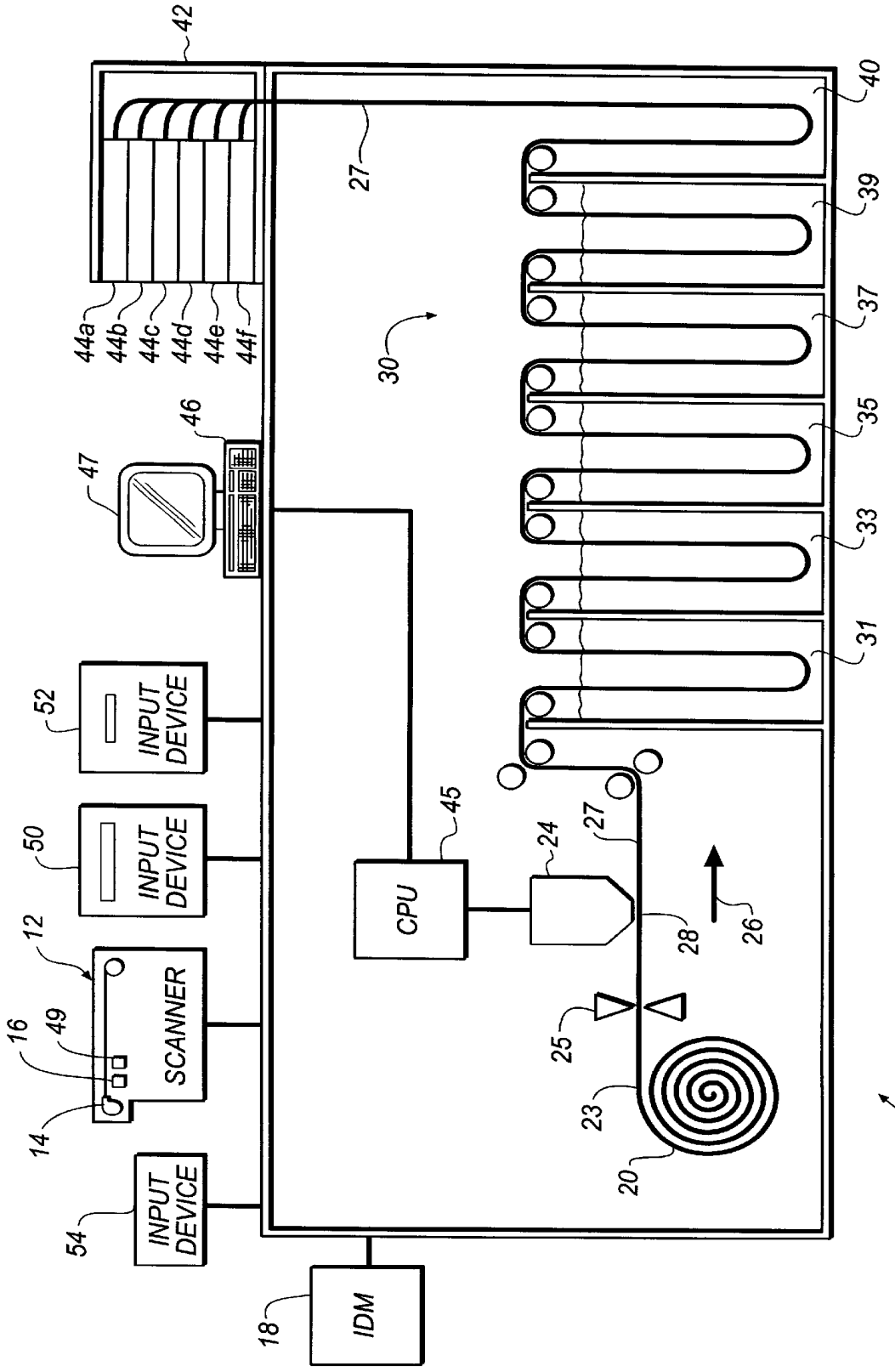


FIG. 4c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44e
44f
30
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47
52
INPUT DEVICE
50
INPUT DEVICE
12
SCANNER
16
49
14
54
INPUT DEVICE
18
IDM
CPU
45
24
27
28
26
25
23
20
10

FIG. 5

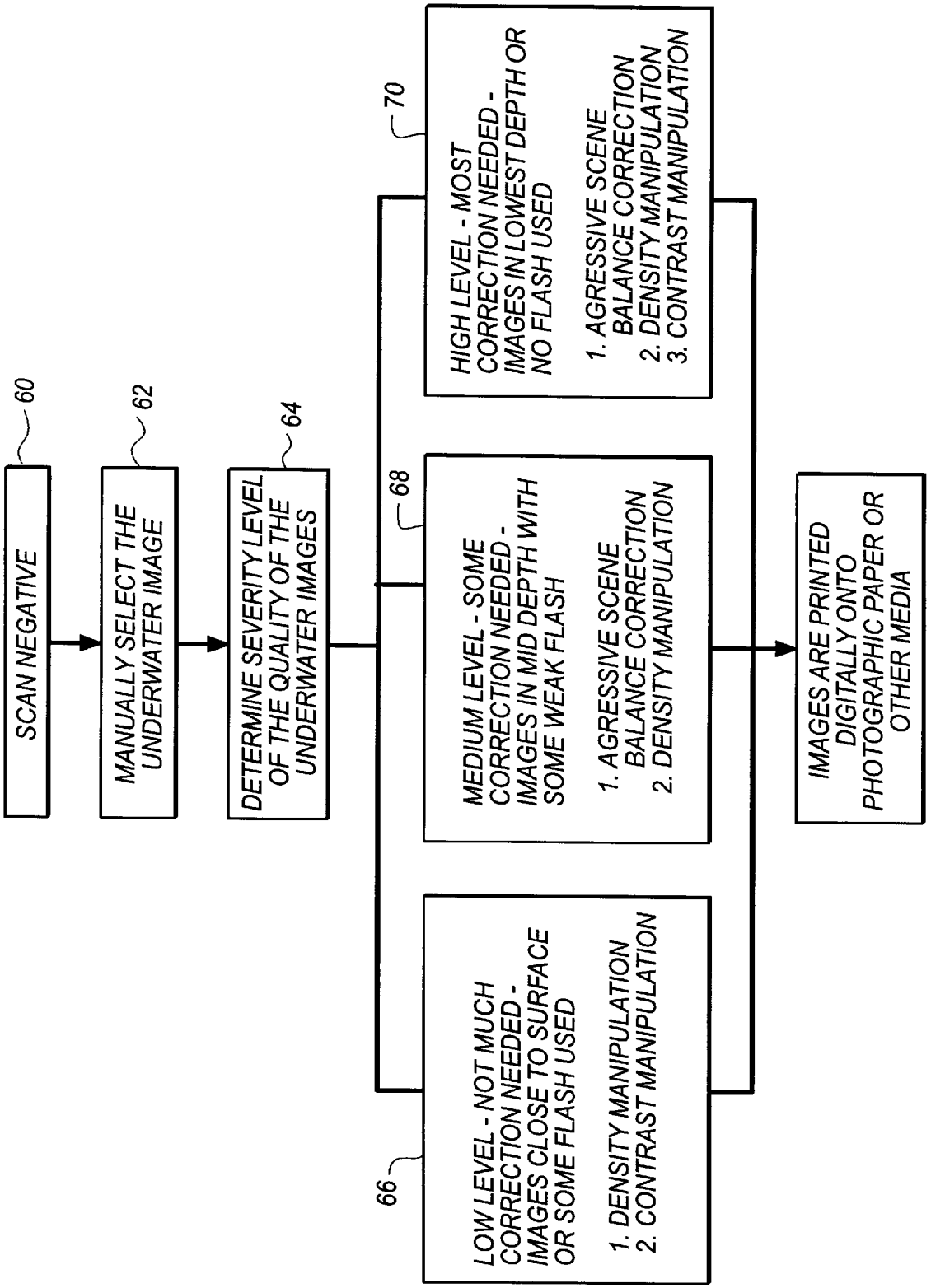
SCAN NEGATIVE
60
MANUALLY SELECT THE UNDERWATER IMAGE
62
DETERMINE SEVERITY LEVEL OF THE QUALITY OF THE UNDERWATER IMAGES
64
LOW LEVEL - NOT MUCH CORRECTION NEEDED - IMAGES CLOSE TO SURFACE OR SOME FLASH USED
1. DENSITY MANIPULATION
2. CONTRAST MANIPULATION
66
MEDIUM LEVEL - SOME CORRECTION NEEDED - IMAGES IN MID DEPTH WITH SOME WEAK FLASH
1. AGRESSIVE SCENE BALANCE CORRECTION
2. DENSITY MANIPULATION
68
HIGH LEVEL - MOST CORRECTION NEEDED - IMAGES IN LOWEST DEPTH OR NO FLASH USED
1. AGRESSIVE SCENE BALANCE CORRECTION
2. DENSITY MANIPULATION
3. CONTRAST MANIPULATION
70
IMAGES ARE PRINTED DIGITALLY ONTO PHOTOGRAPHIC PAPER OR OTHER MEDIA

FIG. 6

METHOD AND SYSTEM OF IMPLEMENTING CORRECTIONS IN UNDERWATER IMAGES

FIELD OF THE INVENTION

The present invention relates to digital printing, and more particularly, printing of images, which were captured underwater.

BACKGROUND OF THE INVENTION

Color prints obtained from images captured underwater are typically very disappointing to the consumer. When an image is captured underwater, red light is filtered out by the water. This filtering effect becomes even worse at greater depths and longer distance from the subject to the camera. This filtering results in prints made from these images to lack the appropriate amount of red. Available light photography becomes more difficult with depth as red light is filtered and the overall illumination becomes lower. This problem persists even when underwater illumination systems are provided because the red light is filtered by the amount of water between the light source and the subject, and then again as the reflected light returns to the camera. As a result, under exposures often suffer from poor image quality when reproduced by traditional systems.

The present approach to solving the problem of an image captured underwater includes over-exposing of the image. However, this only helps if the blue and green channels are not driven to clipping where the blue and green channels lose detail from saturation, and if compensation is made in the printing of the color negative. Placing a filter, such as a blue and green filter, over the camera's lens and metering system can help, but this decreases the overall light level and maintains a fixed ratio between the color channels. There has also been suggested the use of reversal film with an altered color balance. However, this is often costly in development and the fixed amplification ratio in the three color channels does not account for variations in depth and is subject to camera distance. While flash systems and other artificial lighting can be utilized, the distance between the subject and camera must be accounted for. While macro exposures are often used to minimize this distance problem, close-up photography may not be practical or desirable.

In co-pending U.S. patent application entitled "Method And Apparatus For Printing Digital Images" to John R. Fredlund, Ser. No. 09/248,967 filed Feb. 12, 1999, there is disclosed a method for automatically determining if an image was captured underwater and then compensating for this. While very helpful, this reference does not disclose or teach how to determine the depth at which the image was captured or for compensating the correction to the image based on such information.

Thus, there exists a need to improve the quality of prints made from images captured underwater in an efficient and accurate manner.

SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention there is provided a method for printing a customer image order, containing at least one image captured underwater, comprising the steps:

a) obtaining a digital record of a customer image order containing at least one image and determining if the at least one image was captured underwater;

b) determining the level of correction necessary for the image,

c) manipulating the digital record of the at least one image captured underwater in a predetermined manner in accordance with the determined level of correction; and

d) digitally printing the image captured underwater in accordance with the corrections.

In accordance with another aspect of the present invention there is provided a method of printing a customer image order containing at least one image captured underwater, comprising the steps of:

a) scanning a photosensitive media containing a customer image order having a plurality of images so as to obtain a digital record,

b) determining if an image contained in the digital record has been captured underwater,

c) determining the level of correction necessary for the image; and

d) modifying the portion of the digital record containing the at least one image captured underwater so as to provide modified image in accordance with the determined level of correction.

In accordance with yet another aspect of the present invention there is provided an apparatus for printing customer image orders containing at least one image captured underwater, comprising:

means for obtaining digital record of a customer image order having at least one digital image;

means for determining if any one of the at least one image has been captured underwater;

means for determining the level of correction necessary for the image; and

means for modifying any one of the at least one images captured underwater in accordance with the determined level of correction.

In still another aspect of the present invention there is provided a computer program product, comprises a computer readable storage medium having a computer program thereon which when loaded into a computer, causes the computer to performance the following steps:

a) obtaining a digital record of a customer image order containing at least one image;

b) determining if any of the at least one images were captured underwater;

c) determining the level of correction necessary for the image,

d) manipulating the digital record of the at least one image captured underwater in a accordance with the level of correction; and

e) digitally printing, storing, or displaying the image captured underwater in accordance with the manipulation to the digital record.

The above, and other objects, advantages and novel features of the present invention will become more apparent from the accompanying detailed description thereof when considered in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described with reference to the drawings in which:

FIG. **1** is a schematic view of printing apparatus made in accordance with the present invention; and

FIG. **2** is a top plan view of a portion of a filmstrip which may be used with the apparatus of FIG. **1**;

FIGS. **3***a*, **3***b* and **3***c* are histograms of an image taken under normal conditions for each of the three color channels;

FIGS. **4***a*, **4***b* and **4***c* are histograms of an image taken underwater for each of the three color channels;

FIG. **5** is a schematic view of a modified system in accordance with the present invention; and

FIG. **6** is a flow chart of the method of implementing the amount of correction to be made to the image.

DETAILED DESCRIPTION OF THE INVENTION

The present description will be directed, in particular, to elements forming part of, or in cooperation more directly with, the apparatus in accordance with the present invention, it being understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

Referring to FIG. **1**, there is illustrated an apparatus **10** made in accordance with the present invention. In particular, the apparatus **10** is an apparatus designed to print digital images onto a photosensitive media (material). In particular, the apparatus **10** is of the type commonly referred to as a photographic minilab. As is typical with most mini-labs, customer image orders are provided for printing of images onto a photosensitive media. A customer image order, for the purposes of the present invention, is a single roll of developed photographic film or digital record file of a single printing order containing a plurality of images thereon. In the particular embodiment illustrated, the apparatus **10** includes a scanner **12**, which is designed to receive and scan a roll of developed film **14**. The roll of developed film **14** is transported past sensor **16** in scanner **12**, which scans the images on the film **14** so as to provide a digital record of the customer images. The scanner **12** scans at a resolution sufficient to provide the desired quality prints. The scanner should scan at a resolution of at least 500×700 pixels per inch, generally at least 1000×1500 pixels per inch. Preferably, the scanner **12** scans at a high resolution equal to or greater than about 2000×3000 pixels per inch. The digital record of the image is forwarded to an image data manager (IDM) **18** wherein the images are manipulated as preprogrammed. In the embodiment illustrated, IDM **18** comprises a computer (microprocessor) used for manipulation of the digital images contained in the digital record file. The IDM **18** includes a memory for storing of the digital record of the customer image order.

The apparatus **10** further includes a supply roll **20** containing a web of photosensitive media **23**, which in the present invention comprises photographic paper. A cutting mechanism **25** is provided for cutting the web of photosensitive media into individual cut sheets. The mechanism **25** may cut the web into sheets having any desired lengths. Appropriate transport mechanisms, not shown, are provided for advancing of the cut sheets in the direction indicated by arrow **26** along processing path **27** through apparatus **10**. In particular, the cut sheets are transported from cutting mechanism **25** to an exposure gate **28** whereby a digital printer **24** exposes the individual images of the customer image order onto individual cut sheets, respectively, as the pass exposure gate **28**. In the particular embodiment illustrated, the digital printer **24** is a MLVA (Micro Light Valve Array) printer which scans a light containing image data onto cut sheets as they moves in the direction indicated by arrow **26** past exposure gate **28**. Since printer **24** is a digital printer and the cutting mechanism **25** may cut the web of photosensitive media **23** into any desired length cut sheets, the images produced on cut sheets may be provided in a variety of different format sizes being constrained only by the printing capabilities of the printer **24** and width of the web of the photosensitive media **23**. It is also to be understood that the printer **24** may be any appropriate digital printer, for example, a CRT printer, LED printer, LCD printer, laser printer or other type of digital printer that can print onto a photosensitive media. Additionally, digital printer **24** may use non-photosensitive media such as an ink jet or thermal dye sublimation printer may also be use.

In the embodiment illustrated, the web of photosensitive media **23** comprises photographic paper, however, the media may comprise of other media capable of being printed on by a digital printer. While the apparatus **10** is shown the web of photosensitive media is first cut into individual cut sheets prior to printing, the present invention is not so limited. The digital images may be first printed on the web of photosensitive media **23** which at some later time, before or after processing, is cut into individual cut sheets forming individual prints, each print being representative of a print of a single customer image. As is typical with mini-labs, the apparatus **10** is further provided with a processing section **30** wherein the cut sheets, after leaving exposure gate **28**, are passed therethrough for development as is customarily done in such devices. In the particular embodiment illustrated, the cut sheets are passed through a developer station **31** containing a developer solution, a bleach/fix station **33** containing a bleach/fix solution, a plurality of wash stations **35**, **37** and **39** each containing a washing solution, and through a dryer section **40** for drying of the photosensitive media. The individual prints of the images are then forwarded to sorter **42** wherein the prints for each customer image order are collated into separate bins **44***a–f*, each bin preferably receiving an individual customer image order. It is to be understood that any desired number of bins **44** may be provided as appropriate for the apparatus **10** and sorted in accordance with any desired sorting criteria.

As is customary, a CPU (computer) **45**, is provided for controlling operation of the apparatus **10** and its various components. A user/operator interface **46**, which includes a viewing screen **47**, is also provided, for allowing an operator to enter instructions for operation of the apparatus **10** and monitor operation of the apparatus as is customarily done.

An appropriate computer printing program is provided for controlling operation of the IDM **18**. The computer program is provided in an appropriate format which allows loading of the program into the apparatus, which causes the computer to perform the required steps. In particular, the computer program is designed so that the IDM **18** will first obtain and store a complete customer image order prior to printing. In addition, appropriate algorithms are provided for analyzing, manipulating and correcting of the digital images prior to printing.

Referring to FIG. **2**, there is illustrated a portion of a strip **48** of developed photographic film which may be used in the apparatus **10** of the present invention. In the particular embodiment illustrated, the filmstrip **48** has a plurality of images **51** formed thereon and includes a magnetic layer **49** upon which instructional codes or information may be provided. It is of course understood that information and/or instructional codes may be provided on the filmstrip in any desired manner. In the particular embodiment illustrated, instructional codes placed thereon may indicate that the entire roll or a specific image on the roll has been captured underwater conditions. If it is known by the manufacturer or packager of the film, that the film may be used for capturing images underwater, an instructional code may be placed on the film indicating such. Otherwise, the camera, or other device such as an order bag, may be used to provide

information that any one image or that all of the images on the roll of film was captured underwater. The scanner **12** having read this information, passes the information on to the IDM **18** whereas an appropriate algorithm can be employed so as to be compensate for the fact that the image has been captured underwater. Preferably, the images are corrected such that when printed and/or otherwise visually displayed the image will have a color balance generally the same or more similar to an image take under normal conditions (not underwater). In particular, the appropriate amount of red color channel can be improved to a degree which will give an appearance that the image was taken under normal capture conditions.

Typically, underwater images are deficient in the red channel. A manipulation which can correct this can be as simple as the change in color balance which an operator might key into a traditional photofinishing system. However, it is the subject of this invention to describe the following method which improves upon this existing system.

The entire underwater scene is analyzed and an aggressive scene balance algorithm is applied. The aggressive scene balance algorithm is applied to the entire image and is designed to cause the entire image to be driven such that the average is neutral. A typical scene balance algorithm does not drive as far to neutral as this would typically result in an undesirable visual appearance.

Underwater images may be improved by expanding the contrast of the image once the desired color balance has been achieved. This is to say that the brightest areas in the image are reproduced as white, and the darkest areas are reproduced as black. The values in-between are "stretched" to provide a smooth transition from black to white. This contrast expansion provides the image with a more pleasing high-contrast appearance.

The third correction which may be applied is that of noise suppression. Particularly, because the red channel is amplified to more closely match the blue and green channels, it is likely that there will be noticeable noise in the red record. It is possible to average out some of this high frequency noise such that a more desirable image is produced.

It is to be understood that the information that the images were captured underwater may be provided in any other desired manner for example but not by way of limitation, the information may be noted on the order envelope which in turn can be read by the operator and programmed into the apparatus. Additionally the information made be obtained from a memory storage device, such as a card, used by a digital camera. This information can be also be obtained from a one-time use camera. That is, a one-time use camera designed for use underwater wherein a preprogrammed code is provided on the camera, film cartridge or directly on the film within the camera. This information or code can be manually entered into the apparatus **10** or read from the packaging, camera, film or cartridge.

It is also possible to determine when an image has been taken underwater by analyzing the scanned image. Thus, the apparatus **10** may be programmed to automatically identify when an image has been captured in underwater conditions and automatically adjusts to compensate for such capture. Varying amounts of correction may be applied due to degree of difference from the daylight image capture "norm." An image with minor difference is corrected less than one which differs greatly. Also, some images may be deemed unsalvageable and may not be corrected, or corrected in a different fashion (e.g. contrast expansion and noise suppressed but not color balanced).

Referring to FIGS. **3***a*, **3***b*, **3***c*, there is illustrated three histograms of the red, blue and green channels of a typical image taken under normal lighting conditions. A histogram is a graphic representation of the final distribution (the brightness and darkness levels) in an image which plots the number of pixels at each brightness level. As can be seen from FIGS. **3***a*, **3***b*, **3***c*, an image captured under normal condition produce histograms for each of the color channels which look quite similar. Although they are never the same for any color image, the three channels have enough of a similar distribution to appear "balanced." A histogram for the three color channel underwater image capture will not show this balance.

Referring to FIGS. **4***a*, **4***b*, and **4***c* there are illustrated histograms of each of the three color channels of an image capture underwater. Due to the attenuating effects of water on red light, the captured image will characteristically have much higher levels of blue and green than red. This is shown by FIG. **4***a* by skewing red values to the darker brightness levels. The low level of red light relative to that of green and blue is characteristic of images captured underwater. An algorithm for detecting underwater exposures in need of color correction analyzes images for this characteristic, that is a lack of balance between red vs. blue and green channels. If this signature is not found, the underwater correction is not applied and if the underwater characteristic is found then the correction algorithm is applied. By this means even groups of images that have images exposed underwater and above water can both be printed correctly. After an image has been scanned by scanner **12**, appropriate histograms of each image may be obtained and compared with the curves of FIGS. **4***a*, **4***b* and **4***c*. When the curves of the histogram obtained for the scanned image fall within predetermined parameters in relation to the histograms of FIGS. **4***a*, **4***b* and **4***c*, this will advise the IDM **18** that the image was captured underwater at which time an appropriate correction algorithm is used for modifying the appropriate color channels to compensate for such capture.

In order to better understand the present invention, a description of its use will be discussed. A customer image order is received by the retail establishment, the customer image order typically comprising a roll of undeveloped film. The film is then developed and forwarded to a printing apparatus, such as apparatus **10** previously described, for printing. The photographic film is scanned by scanner **12** whereby the images are digitized and forwarded onto IDM **18**. In addition, scanner **12** reads any instructional code or information identifying that an image, or that the entire roll of images was captured underwater. If such images exist, an appropriate correction algorithm is activated for such images so prior to forwarding onto the digital printer. Alternatively, if no code is read an appropriate detection algorithm is provided in the IDM for analyzing the digital record to determine if any of the images were taken underwater. As previously discussed, this can be accomplished by developing histograms (or data representing the histogram) for each of the images and comparing the developed histogram with stored histograms of underwater images for detecting if the images were captured underwater. An appropriate correction algorithm is activated and applied to the underwater images if it is determined that images were taken underwater. Once the underwater captured images have been digitally corrected, the images are then forwarded onto the digital printer for printing along with the rest of the customer image order.

In the embodiments discussed above, the images for printing are obtained by scanning a developed roll of pho-

tosensitive film. However, the present invention is not so limited. As illustrated in FIG. **1**, image data and customer image order may be obtained from a variety of different sources whereby a customer image order may be submitted for printing, including providing of information of where the printed images are to be forwarded. For example, image input devices **50**, **52**, **54** may be provided wherein input device **50** may provide the images supplied on a CD, device **52** can be used to obtain images provided on computer disk, or memory card, and a communication modem **54** may be provided to receive images over the internet, or from any other source that can forward digital images.

In the embodiment illustrated, the apparatus **10** does the printing, however, the present invention is not so limited. For example, the printing can be forwarded onto a different device for storage, printing and/or display. For example, the IDM **18** may forward the image through modem **54** to a customer or other device for providing and/or storing images.

In the embodiment illustrated in FIG. **1**, the individual components are illustrated as a single apparatus **10**. However, the present invention is not so limited. Referring to FIG. **5**, there is illustrated a modified form of the present invention, like numerals indicating like parts and operation as previously discussed. In this embodiment, the scanner **12**, IDM **18** and devices **50**, **52**, **54** are shown as separate individual components from the apparatus **10**, which is used for printing of the images onto a photosensitive media. The operation and function of all the elements are the same except that individual elements are discrete elements that can be separate from each other and connected by appropriate communication lines as is well known to those of ordinary skill in the art.

In the embodiment illustrated, the processing of the photosensitive media is done by the apparatus **10**. However, the present invention is not so limited. For example, the images may be printed on the web of photosensitive material **23** and forwarded in web form to a processor wherein the images are developed after which the developed web is forwarded onto a finishing station wherein the web is cut into individual prints and sorted by customer image order.

Referring to FIG. **6**, there is illustrated a flow chart for implementing corrections to the digital image file of underwater scenes in response to various scene conditions. As discussed previously, the image negative is scanned at step **60** so as to obtain a digital record file of the image. At step **62**, underwater images are selected for correction. At step **64**, the level of correction is determined. In the particular embodiment described, an individual would visually inspect a display of the digital file and determine a level of correction to be implemented. For example, an image requiring a low level of correction i.e. an image captured just below the surface or with some degree of flash will exhibit more natural colors and some degree of blue coloration, whereas an image requiring a moderate level of correction i.e. an image taken at mid-depth with weak flash will have a higher degree of blue coloration, and images requiring high levels of correction i.e. images taken at great depth or with no flash will exhibit a high degree of blue coloration and a low contrast appearance. Having determined the degree of correction, the image will be manipulated at one of the three correction steps **66**, **68**, or **70**. Thus if the image has been determined to need a low level of correction, the image will be forwarded to step **66** for an appropriate correction of density and contrast If the image requires a medium level, it will be forwarded onto step **68**, where an aggressive scene balance algorithm and density manipulation will be performed. If the image requires a high level, it will be forwarded onto step **70**, where an aggressive scene balance algorithm, density, and contrast manipulation will be performed. As it can be seen from the foregoing, the amount of correction made to the image is dependent upon the degree in which the image has been affected by being captured underwater. While the particular embodiment illustrates the use of three level of correction, it is to be understood that any number of levels may be provided, each having a different degree of correction.

While the embodiment associated with FIG. **6** uses a visual inspection for selecting the underwater images and determining the level of correction, this can be done automatically by appropriate analytic tools. As previously discussed the determination of underwater images can be accomplished by analyzing histograms as previously discussed, and the level of correction of color, density, and contrast may be determined by analyzing the content of the captured digital image.

It is to be understood that various other changes and modifications may be made without departing from the scope of the present invention. The present invention being defined by the following claims.

PARTS LIST

10	Apparatus
12	Scanner
14	Developed film
16	Sensor
18	Image data manager (IDM)
20	Supply roll
23	Photosensitive media
24	Digital printer
25	Cutting mechanism
27	Processing path
26	Arrow
28	Exposure gate
30	Processing section
31	Developer station
33	Bleach/fix station
35	Wash station
37	Wash station
39	Wash station
40	Dryer section
42	Sorter
44a–f	Bins
45	CPU (computer)
46	User/operator interface
47	Viewing screen
48	Filmstrip
49	Magnetic layer
50	Input device
51a–c	Images
52	Input device
54	Input device
60	Step
62	Step
64	Step
66	Step
68	Step
70	Step

What is claimed is:

1. A method for printing a customer image order, containing at least one image captured underwater, comprising the steps:

a) obtaining a digital record of a customer image order containing at least one image and determining if said at least one image was captured underwater by analyzing said digital record;

b) determining the level of correction necessary for said image,

c) manipulating the digital record of said at least one image captured underwater in a predetermined manner in accordance with said determined level of correction; and

d) digitally printing said image captured underwater in accordance with said corrections.

2. A method according to claim **1** wherein said predetermined manner comprises correcting the color appearance to that of an image not captured underwater.

3. A method according to claim **1** wherein said predetermined manner comprises expanding the contrast to that of a generally captured image.

4. A method according to claim **1** wherein said predetermined manner comprises reducing the density to that of a generally captured image.

5. A method according to claim **1** wherein said obtaining a digital record comprises scanning photosensitive media.

6. A method according to claim **5** wherein said photosensitive media comprises a roll of photosensitive film.

7. A method according to claim **1** wherein said digital record is obtained form a device which reads digital information from a memory storage device.

8. A method according to claim **7** wherein said memory storage device is a CD.

9. A method according to claim **7** wherein said memory storage device is a computer disc.

10. A method according to claim **7** wherein said memory storage device is a memory card.

11. A method according to claim **1** wherein said levels of correction comprise a plurality of levels.

12. A method according to claim **1** wherein said determining if said at least one image was captured underwater comprises analyzing said at least one image.

13. A method according to claim **12** wherein said analyzing said at least one image comprise producing histograms of said images and compares them with stored information representative of histograms of images taken underwater.

14. A method of printing a customer image order containing at least one image captured underwater, comprising the steps of:

a) scanning a photosensitive media containing a customer image order having a plurality of images so as to obtain a digital record,

b) determining if an image contained in said digital record has been captured underwater by analyzing said digital record,

c) determining the level of correction necessary for said image; and

d) modifying the portion of said digital record containing said at least one image captured underwater so as to provide modified image in accordance with said determined level of correction.

15. A method according to claim **14** further comprising the step of digitally printing and/or displaying said image captured underwater as digitally modified.

16. A method according to claim **14** further comprising the step of digitally storing said image captured underwater as digitally modified.

17. A method according to claim **14** wherein said automatically determining if an image contained in said digital record has been captured underwater comprises obtaining information comprises from said customer image order.

18. A method according to claim **17** wherein said information is obtained from a package containing the customer image order.

19. A method according to claim **14** wherein said photosensitive media comprises a photographic media.

20. A method according to claim **18** wherein said information is obtained by reading an instructional code provided on said photographic media.

21. A method according to claim **17** wherein said information is obtained by reading an instructional code provided on a one-time use camera containing said photographic media, the film in a one-time use camera, or packaging containing a one-time use camera.

22. A method according to claim **14** wherein said automatically determining if an image contained in said digital record has been captured underwater comprises analyzing said digital record.

23. A method according to claim **22** wherein said analyzing comprises the step of determining histograms for said images in said digital record and comparing them with histograms representative of images taken underwater.

24. An apparatus for printing customer image orders containing at least one image captured underwater, comprising:

means for obtaining digital record of a customer image order having at least one digital image;

means for determining if any one of said at least one image has been captured underwater by analyzing said digital record;

means for determining the level of correction necessary for said image; and

means for modifying any one of said at least one images captured underwater in accordance with said determined level of correction.

25. An apparatus according to claim **24** wherein said levels of correction each having a different degree of correction.

26. A computer program product, comprises a computer readable storage medium having a computer program thereon which when loaded into a computer, causes the computer to performance the following steps:

a) obtaining a digital record of a customer image order containing at least one image;

b) determining if any of said at least one images were captured underwater by analyzing said digital record;

c) determining the level of correction necessary for said image,

d) manipulating the digital record of said at least one image captured underwater in a accordance with said level of correction; and

e) digitally printing, storing, or displaying said image captured underwater in accordance with said manipulation to the digital record.

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